35 U.S.C. § 103 (Obviousness)

Claims 1–4, 6–8 and 11–*16* were rejected under 35 U.S.C. § 103(a) as being unpatentable over U.S. Patent No. 6,275,531 to *Li*. Claims 9–10 were rejected under 35 U.S.C. § 103(a) as being unpatentable over *Li* in view of U.S. Patent No. 5,742,892 to *Chadda*. These rejections are respectfully traversed.

The present invention relates generally to streaming video comprising baser layer data and enhancement layer data, where a detected loss of bandwidth during a given time period or interval triggers transmission of less enhancement layer data.

Each of independent claims 1, 7 and 9–11 recites performing actions with respect to "a given interval," and thus requires that the streaming video data be logically divided into time intervals, which the specification teaches are integer number of clock periods T. With regard such intervals, the prior Office Action stated:

> The applicant should also note that the claims "*given interval*" is analogous to Li's interval disclosed in col. 1, lines 46–47.

Paper No. 4, page 3. The final Office Action cites an additional portion of *Li*:

> While the examiner understands the applicants argument, the examiner wishes to point to Li col. 5, lines 47-56 which is a more detailed definition of the previously cited section of Li (col. 1, line 46-47). The applicant should also note that Li clearly indicates that the scalable video coding technique is very desirable for transmitting video over a time varying bandwidth. Therefore, the step of providing " a given interval" in Li is rather inherent (See Li col. 2, lines 28-37 and col. 8, lines 64-67).

Paper No. 6, page 3. However, the previously cited portion of *Li* actually relates to encoding

video data, not to streaming the encoded video data, while the newly-cited portion of *Li* relates to adapting the number of bitstreams that are transmitted at the beginning of transmission:

> The basic idea behind MPEG video compression is to remove spatial redundancy within a video frame and temporal redundancy between video frames. The DCT-based (Discrete Cosine Transform) compression is used to reduce spatial redundancy and motion compensation is used to exploit temporal redundancy. The images in a video stream usually do not change much within small time intervals. Thus, the idea of motion-compensation is to encode a video frame based on other video frames temporally close to it.
>
> . . . .
>
> The bitstream from the base layer encoder 30 and the N bitstreams from the enhancement layer encoder 40 are capable of being sent to the transmission channel 60 by at least two methods. In the first method all bitstreams are multiplexed together by multiplexor 50 with different priority identifiers, e.g., the base layer bitstream is guaranteed, enhancement bitstream layer 1 provided by enhancement layer encoder 40 is given a higher priority than enhancement bitstream layer 2. The prioritization is continued until all N (wherein N is an integer from 0, 1, 2, . . .) of the bitstreams layers are prioritized. Logic in the encoding layers 30 or 40 in negotiation with the network and intermediated devices determine the number N of bitstream layers to be generated.
>
> The number of bitstream layers generated is a function of the total possible bandwidth of the transmission channel 60, i.e. Ethernet, LAN, or WAN connections (this list is not intended to exhaustive but only representation of potential limiting devices and/or equipment), and the network and other intermediate devices. The number of bitstream layers M (wherein M is an integer and $M \leq N$) reaching the destination point 100 can be further limited by not just the physical constraints of the intermediate devices but the congestion on the network, thereby necessitating the dropping of bitstream layers according to their priority.
>
> In a second method the server 50 knows the transmission channel 60 condition, i.e. congestion and other physical constraints, and selectively sends the bitstreams to the channel according to the priority identifiers. In either case, the destination point 100 receives the bitstream for the base layer and M bitstreams for the enhancement layer, where $M \leq N$.
>
> The bitstreams M are sent to the base layer 90 and enhancement layer 80 decoders after being demultiplexed by demultiplexor 70. The decoded

> enhancement information from the enhancement layer decoder is passed to the base layer decoder to composite the reconstructed video output 100. The decoding of the multiplexed bitstreams are accomplished pursuant to the methods and algorithms depicted in flow diagrams 1100-1400 of FIGS. 11-14, respectively.

Li, column 1, lines 41–49; column 5, line 43 through column 6, line 15. The cited portion of *Li* thus relates to sending, for an entire transmission, a number of enhancement layers based on physical constraints of intermediate devices, where some enhancement layers are dropped by the receiver due to congestion on intermediate devices, or alternatively sending, for the entire transmission, a number of enhancement layers based on congestion as well as physical constraints. *Li* does not teach or suggest adjusting the number of enhancement layers transmitted during transmission, and the logical division of the transmission period into intervals is therefore not necessary or inherent to the mechanism disclosed by *Li*.

The independent claims also each recite determining whether a loss of bandwidth has occurred during a particular interval. The Office Action argues that identification of various conditions indicating a loss of bandwidth is sufficient to anticipate this limitation. However, recognition that bandwidth may be time varying does NOT constitute determining whether a loss of bandwidth occurs during a given interval or period. Moreover, *Li* does not enable making such a determination.

Finally, each of the independent claims recites adapting the transmission to any loss of bandwidth during the given interval by calculating a reduced amount of enhancement data

which may be transmitted given the constraint of the bandwidth loss, and transmitting such a reduced amount of enhancement layer data. Such a feature is not shown or suggested by the cited reference. As noted above, *Li* teaches adapting an entire video data stream to constraints such as available bandwidth for a particular client, or the priority of concurrently transmitted video data streams, but does not teach of suggest dynamically adapting the granularity of the video data stream during streaming to accommodate a loss of bandwidth during at a particular time period or interval. *Li* only teaches that the number M of bitstreams generated is selected based on knowledge of channel conditions, but does not teach or suggest (or enable) dynamic modification of the number of bitstreams generated due to changing conditions during transmission, rather than initial selection of the number of bitstreams for an entire transmission cycle.

With respect to claims 9–10, the features identified above are also not shown or suggested by *Chaddha*. *Chaddha* teaches providing a "scalable" video stream comprising a single stream from which different decoders may extract information at different spatial and temporal resolutions using different data rates. None of the features of the independent claims identified above are shown or suggest by *Chaddha*, taken alone or in combination with *Li*.

Claims 3 and 8 recite distributing the reduction in enhancement layer data evenly over a predetermined number of frames. Such a feature is not shown or suggested by *Li*. As noted in the Office Action, *Li* teaches adapting transmissions of multiple video streams based on

individual priorities associated with each stream. However, *Li* does not teach or suggest allocating any constraints on lower priority streams evenly across all such lower priority streams. Thus, even if adaptation based on priority were analogous to adaptation based on lost bandwidth, *Li* does not teach or suggest the recited limitation.

Therefore, the rejection of claims 1–4, 6–16 under 35 U.S.C. § 103 has been overcome.

PENDING CLAIMS

1. (unchanged) A method for streaming scalable video including base layer data and enhancement layer data, comprising the steps of:

transmitting the base layer data for a given interval;

determining if a loss of bandwidth has occurred in the given interval;

selecting a predetermined number of frames to distribute the loss of bandwidth over;

calculating a reduced amount of enhancement layer data to transmit in the predetermined number of frames; and

transmitting the reduced amount of enhancement layer data in the given interval.

2. (unchanged) The method according to claim 1, further comprising:

transmitting non-enhancement layer data during the given interval.

3. (unchanged) The method according to claim 1, wherein the calculating step is performed so that the loss of bandwidth is distributed evenly over the predetermined number of frames.

4. (unchanged) The method according to claim 1, further comprising the steps of:

determining if there is still space in the given interval; and

transmitting at least a portion of the reduced amount of enhancement layer data from a second given interval in the given interval.

5. (unchanged) The method according to claim 1, further comprising the steps of:

determining if the pre-determined number of frames has expired;

determining if any left-over enhancement layer data exists;

selecting a second predetermined number of frames to distribute the left-over enhancement data over;

calculating a second reduced amount of enhancement layer data to transmit in the second predetermined number of frames; and

transmitting the second reduced amount of enhancement layer data in a second given interval.

6. (unchanged) The method according to claim 1, wherein the enhancement layer data has a fine grain scalability structure.

7. (unchanged) A method for streaming scalable video including base layer data and enhancement layer data, comprising the steps of:

transmitting the base layer data for a given interval;

selecting a predetermined number of frames if a loss of bandwidth has occurred in the given interval;

distributing the loss of bandwidth over the predetermined number of frames to produce a reduced amount of enhancement layer data; and

transmitting the reduced amount of enhancement layer data in the given interval.

8. (unchanged) The method according to claim 7, wherein the distributing step is performed so that the loss of bandwidth is distributed evenly over the predetermined number of frames.

9. (unchanged) A memory medium including code for streaming scalable video including base layer data and enhancement layer data, the code comprising:

a first transmitting code to transmit the base layer data for a given interval;

a determining code to determine if a loss of bandwidth has occurred in the given interval;

a selecting code to select a predetermined number of frames to distribute the loss of bandwidth over;

a calculating code to calculate a reduced amount of enhancement layer data to transmit in the predetermined number of frames; and

a second transmitting code to transmit the reduced amount of enhancement layer data in the given interval.

10. (unchanged) An apparatus for streaming scalable video including base layer data and enhancement layer data, comprising:

a memory which stores executable code; and

a processor which executes code stored in the memory so as to (i) transmit the base layer data for a given interval, (ii) determine if a loss of bandwidth has occurred in the given interval, (iii) select a predetermined number of frames to distribute the loss of bandwidth over, (iv) calculate a reduced amount of enhancement layer data to transmit in the predetermined number of frames, and (v) transmit the reduced amount of enhancement layer data in the given interval.

11. (unchanged) An apparatus for streaming scalable video including base layer data and enhancement layer data, comprising:

means for transmitting the base layer data for a given interval;

means for determining if a loss of bandwidth has occurred in the given interval;

means for selecting a predetermined number of frames to distribute the loss of bandwidth over;

means for calculating a reduced amount of enhancement layer data to transmit in the predetermined number of frames; and

means for transmitting the reduced amount of enhancement layer data in the given interval.

12. (unchanged) The method according to claim 1, wherein the predetermined number of frames over which the loss of bandwidth is distributed comprises frames within the given interval.

13. (unchanged) The method according to claim 1, wherein the step of calculating a reduced amount of enhancement layer data to transmit in the predetermined number of frames further comprises:

calculating an amount of enhancement layer data accommodating the loss of bandwidth during the given interval.

14. (unchanged) The method according to claim 1, wherein the step of determining if a loss of bandwidth has occurred in the given interval further comprises:

determining a number of bits during the given interval consumed by transmission of non-enhancement layer data.

15. (unchanged) The method according to claim 1, wherein the step of determining if a loss of bandwidth has occurred in the given interval further comprises:

determining a number of bits during the given interval lost due to packet loss, noise, or bandwidth variation.

16. (unchanged) The method according to claim 1, wherein the step of calculating a reduced amount of enhancement layer data to transmit in the predetermined number of frames further comprises:

calculating a number of lost bandwidth bits to be allocated to each of the predetermined number of frames.

SUMMARY

For the reasons given above, the Applicant respectfully requests reconsideration and allowance of pending claims and that this Application be passed to issue. If any outstanding issues remain, or if the Examiner has any further suggestions for expediting allowance of this Application, the Applicant respectfully invites the Examiner to contact the undersigned at the telephone number indicated below or at ***wmunck@davismunck.com***.

The Commissioner is hereby authorized to charge any additional fees connected with this communication or credit any overpayment to Deposit Account No. 50-0208.

Respectfully submitted,

DAVIS MUNCK, P.C.

Date: Oct. 3, 2002

William A. Munck
Registration No. 39,308

P.O. Drawer 800889
Dallas, Texas 75380
Phone: (972) 628-3600
Fax: (972) 628-3616
E-mail: *wmunck@davismunck.com*